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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/826,117
Filing Date	01/09/2001
First Named Inventor	Urbain A. von der Embse
Art Unit	2616
Examiner Name	Rhonda L. Murphy
Attorney Docket Number	
Total Number of Pages in This Submission	

ENCLOSURES *(Check all that apply)*

- [ ] Fee Transmittal Form
  - [x] Fee Attached
- [x] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) ______
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

Remarks

RCE request
and amended claims

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name			
Signature	Urbain A. von der Embse		
Printed name	Urbain A. von der Embse		
Date	10/12/2006	Reg. No.	

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature	Urbain A. von der Embse		
Typed or printed name	Urbain A. von der Embse	Date	10/12/2006

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OCT 16 2006

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/826,117	01/09/2001	Urbain Alfred Von der Embse		4387

7590 08/23/2006

Urbain A. von der Embse
7323 W. 85th Street
Westchester, CA 90045-2444

EXAMINER	
MURPHY, RHONDA L	
ART UNIT	**PAPER NUMBER**
2616	

DATE MAILED: 08/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

3f

OIPE
OCT 16 2006
PATENT & TRADEMARK OFFICE

Office Action Summary	Application No.	Applicant(s)
	09/826,117	VON DER EMBSE, URBAIN ALFRED
	Examiner	**Art Unit**
	Rhonda Murphy	2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 02 June 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 7-9 is/are pending in the application.

4a) Of the above claim(s) ____ is/are withdrawn from consideration.

5)☐ Claim(s) ____ is/are allowed.

6)☒ Claim(s) 7-9 is/are rejected.

7)☐ Claim(s) ____ is/are objected to.

8)☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on ____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date ____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: ____.

DETAILED ACTION

Response to Amendment

1. This communication is responsive to the amendment filed on 6/2/06. Accordingly, claim 10 has been canceled and claims 7-9 are currently pending in this application.

2. An examination of this application reveals that applicant is unfamiliar with patent prosecution procedure. While an inventor may prosecute the application, lack of skill in this field usually acts as a liability in affording the maximum protection for the invention disclosed. Applicant is advised to secure the services of a registered patent attorney or agent to prosecute the application, since the value of a patent is largely dependent upon skilled preparation and prosecution. The Office cannot aid in selecting an attorney or agent.

A listing of registered patent attorneys and agents is available on the USPTO Internet web site http://www.uspto.gov in the Site Index under "Attorney and Agent Roster." Applicants may also obtain a list of registered patent attorneys and agents located in their area by writing to the Mail Stop OED, Director of the U. S. Patent and Trademark Office, PO Box 1450, Alexandria, VA 22313-1450.

Claim Objections

1. Claims 7 and 9 are objected to because of the following informalities:

In claim 7, lines 6, 7 and 9, the word “their” should be clearly written out to indicate what “their” is referring to.

In claim 9, line 2, “gemeralized” shall be replaced with “generalized”.

In claim 9, line 4, “DFT” shall be replaced with “Discrete Fourier Transform (DFT)”.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 7-9 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 7-9 are directed to a method of generating codes. A practical application for generating the codes has not been described.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 9 recites the limitation "said Hadamard", “said Walsh” and “said DFT” in lines 3-4. There is insufficient antecedent basis for this limitation in the claim.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda Murphy whose telephone number is (571) 272-3185. The examiner can normally be reached on Monday - Friday 8:00 - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chau Nguyen can be reached on (571) 272-3126. The

fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rhonda Murphy
Examiner
Art Unit 2616

RM

Chau T. Nguyen

CHAU NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

APPLICATION NO. 09/826,117

TITLE OF INVENTION: Hybrid Walsh Codes for CDMA

INVENTOR: Urbain A. von der Embse

Currently amended copy of CLAIMS

APPLICATION NO. 09/826,117

TITLE OF INVENTION: Hybrid Walsh Codes for CDMA

INVENTOR: Urbain A. von der Embse

CLAIMS

WHAT IS CLAIMED IS:

Claim 1. (cancelled)

Claim 2. (cancelled)

Claim 3. (cancelled)

Claim 4. (cancelled)

Claim 5. (cancelled)

Claim 6. (cancelled)

Claim **7**. (currently amended) A ~~means~~ method for ~~the design and~~ generation and implementation of ~~encoders and decoders for~~ hybrid Walsh complex orthogonal codes for CDMA, said method comprising the steps: ~~Hybrid Walsh complex orthogonal~~

there are N Walsh codes each with N chips wherein N is a power of 2,

code centers are between chips N/2 and N/2+1,

classify said Walsh codes into even codes and odd codes according to their even and odd properties about said code centers,

sequency is the is the average rate of phase changes over each N chip code length,

said Walsh codes by definition are the {+1,-1} valued orthogonal Hadamard codes re-ordered with increasing sequency,

there are N discrete Fourier transform codes each with N real chips,

re-order said discrete Fourier transform even codes and odd codes

according to increasing frequency,

construct a one-to-one correspondence of said N Walsh codes with said N Fourier transform codes such that sequency corresponds to frequency, even codes correspond to even codes, and odd codes correspond to odd codes,

there are N Discrete Fourier Transform (DFT) codes each with N complex chips,

said DFT codes are arranged in increasing frequency and each code is the complex addition of a real axis code and an imaginary axis code,

construct a mapping which uses said N Fourier codes to construct said DFT codes,

use said mapping and said correspondence to generate real and imaginary axis component codes of said hybrid Walsh codes,

said hybrid Walsh codes $\tilde{W}(c)$ with code index $c=0,1,2,\ldots,N-1$, are re-orderings of said Walsh codes defined by equations

for $c = 0$, $\tilde{W}(c) = W(0) + jW(0)$

for $c = 1,2,\ldots,N/2-1$, $\tilde{W}(c) = W(2c) + jW(2c-1)$

for $c = N/2$, $\tilde{W}(c) = W(N-1) + jW(N-1))$

for $c = N/2+1,\ldots,N-1$, $\tilde{W}(c) = W(2N-2c-1) + jW(2N-2c)$

wherein $W(u)$ is said Walsh code for index u and $j=\sqrt{-1}$,

digital signal processors in the transmitter encoder and receiver decoder for CDMA communications have a memory assigned to said Walsh codes and memories assigned to said real axis and imaginary axis codes of said hybrid Walsh codes,

hybrid Walsh codes are generated by reading code chip values from said Walsh code memory and writing to said hybrid Walsh memories using addresses specified by said re-orderings of said Walsh codes,

said hybrid Walsh codes are read from said real and imaginary axis memories using said addressing for Walsh codes and,

said hybrid Walsh codes are implemented in the CDMA encoder for said transmitter and in the CDMA decoder for said receiver

by replacing existing said Walsh real codes with said hybrid Walsh complex codes using the same code vector indexing.

~~CDMA channelization codes over a frequency band with properties~~

~~inphase (real) codes are equal to a lexicographic reordering permutation of the Walsh code~~

~~quadrature (imaginary) codes are equal to a lexicographic reordering permutation of the Walsh code~~

~~codes have a 1-to-1 sequency-frequency correspondence with the DFT codes~~

~~codes have 1-to-1 even-cosine and odd-sine correspondences with the DFT codes~~

~~codes take values {1+j, -1+j, -1-j, 1-j}~~

~~codes take values {1, j, -1, -j} with a (-45) rotation of axes and a renormalization~~

~~codes have fast encoding and fast decoding algorithms~~

~~encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes~~

~~decoders are implemented in CDMA receivers for representative embodiments as complex conjugate transpose~~

~~multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes~~

Claim **8**. (currently amended) Said codes in Claim 7 have properties comprising:

code chips take values {1+j, -1+j, -1-j, 1-j} in the complex plane,

code chips with a renormalization and rotation of the code matrix take values {1, j, -1, -j} in the complex plane,

inphase axis codes of the said codes are reordered Walsh or Hadamard codes,

quadrature axis codes of the said codes are reordered Walsh or Hadamard codes and,

~~A means for the design and implementation of encoders and decoders for generalized Hybrid Walsh complex orthogonal CDMA channelization codes over a frequency band with properties~~

~~codes can be constructed for a wide range of code lengths by combining with DFT and quasi-orthogonal PN codes using tensor product, direct product, and functional combining~~

~~codes can be constructed as tensor products with DFT codes and quasi-orthogonal PN codes and other codes~~

~~codes can be constructed as direct products with DFT codes and quasi-orthogonal PN codes and other codes and with functional combining~~

~~codes are complex valued~~

codes have fast encoding and fast decoding algorithms.

~~encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes~~

~~decoders are implemented in CDMA receivers for representative embodiments as complex conjugate transpose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes~~

Claim **9.** (currently amended) A ~~means~~ method for generation and implementation of generalized hybrid Walsh codes for CDMA from code sets which include said hybrid Walsh, said Hadamard, said Walsh, said DFT, and pseudo-noise (PN), said method comprising:

tensor products also called Kronecker products are used to construct said codes,

an example 24 chip tensor product code is constructed from a 8 chip hybrid Walsh code and a 3 chip DFT code,

said 24 chip code is defined by a 24 row by 24 column code matrix C_{24} wherein row vectors are code vectors and column elements are code chips,

said 8 chip hybrid Walsh code is defined by a 8 row by 8 column code matrix $\tilde{W}_8$,

said 3 chip DFT code is defined by a 3 row by 3 column code matrix E_3,

said C_{24} is constructed by tensor product of said $\tilde{W}_8$ with said E_3

defined by equation

$$C_{24} = \widetilde{W}_8 \otimes E_3$$

wherein symbol "⊗" is a tensor product operation,

row u+1 and column n+1 matrix element $C_{24}(u+1,n+1)$ of said C_{24} is defined by equation

$$C_{24}(u+1,n+1) = \widetilde{W}_8(u_0+1,n_0+1)\ E_3(u_1+1,n_1+1)$$

wherein

$$\begin{aligned} u+1 &= u_0+1 + 3(u_1+1) \\ u &= 0,1,\ldots,23 \\ n+1 &= n_0+1 + 3(n_1+1) \\ n &= 0,1,\ldots,23 \end{aligned}$$

wherein u,n are code and chip indices for said codes C_{24} and u_0,n_0 are code and chip indices for said code $\widetilde{W}_8$ and u_1,n_1 are code and chip indices for said code E_3,

digital signal processors in said transmitter encoder and receiver decoder for CDMA communications have memories assigned to said C_{24}, $\widetilde{W}_8$, E_3 codes,

said C_{24} codes are generated by reading code chip values from said $\widetilde{W}_8$ memory and said E_3 memory,

said chip values are combined using said equations to yield said chip values for said C_{24} codes and write to said C_{24} memory,

said C_{24} codes are read from said memory and implemented in said encoder for said transmitter and in said decoder for said receiver,

an alternate method uses direct products to construct said codes.

an example 11 chip direct product code is constructed from said 8 chip hybrid Walsh code and said 3 chip DFT code,

said 11 chip code is defined by the 11 row by 11 column code matrix C_{11},

said C_{11} is constructed by direct product of said $\widetilde{W}_8$ with said E_3 defined by equation

$$C_{11} = \underline{\tilde{W}}_8 \oplus E_3$$

wherein symbol "$\oplus$" is a direct product operation,

row u+1 and column n+1 matrix element $C_{11}(u+1,m+1)$ of said C_{11} is defined by equation

$$\begin{aligned} C_{11}(u+1,n+1) &= \underline{\tilde{W}}_8(u_0+1,n_0+1) && \text{for } u=u_0,\ n=n_0, \\ &= E_3(u_1+1,n_1+1) && \text{for } u=8+u_1,\ n=8+n_1, \\ &= 0 && \text{otherwise,} \end{aligned}$$

said digital signal processors in said transmitter encoder and said receiver decoder for CDMA communications have memories assigned to said C_{11}, $\underline{\tilde{W}}_8$, E_3 codes,

said C_{11} codes are generated by reading code chip values from said $\underline{\tilde{W}}_8$ memory and said E_3 memory,

said chip values are used by said equations to yield said chip values for said C_{11} codes and write to said C_{11} memory,

said C_{11} codes are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver,

an alternate method uses functional combining to construct said codes,

an example 11 chip functional combined $\hat{C}_{11}$ code is constructed from said C_{11} codes by using codes to fill the two null subspaces of said C_{11}.

said $\hat{C}_{11}$ codes are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver and,

an alternate method uses a combinations of tensor products, direct products, and functional combining to construct said codes which are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver.

~~the design and implementation of encoders and decoders for complex orthogonal CDMA channelization codes over a frequency band with properties~~

~~inphase (real) codes are equal to a reordering permutation of the Walsh code~~

~~quadrature (imaginary) codes are equal to a reordering permutation of the Walsh code~~

~~codes are complex valued~~

~~codes have fast encoding and fast decoding algorithms~~

~~encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes~~

~~decoders are implemented in CDMA receivers for representative embodiments as complex conjugate tanspose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes~~

Claim **10.** (cancelled)

APPLICATION NO. 09/826,117

TITLE OF INVENTION: Hybrid Walsh Codes for CDMA

INVENTOR: Urbain A. von der Embse

Clean version of how the CLAIMS will read

APPLICATION NO. 09/826,117
TITLE OF INVENTION: Hybrid Walsh Codes for CDMA
INVENTOR: Urbain A. von der Embse

CLAIMS

WHAT IS CLAIMED IS:

Claim 1. (cancelled)

Claim 2. (cancelled)

Claim 3. (cancelled)

Claim 4. (cancelled)

Claim 5. (cancelled)

Claim 6. (cancelled)

Claim **7**. (currently amended) A method for generation and implementation of hybrid Walsh complex orthogonal codes for CDMA, said method comprising the steps:

there are N Walsh codes each with N chips wherein N is a power of 2,

code centers are between chips N/2 and N/2+1,

classify said Walsh codes into even codes and odd codes according to their even and odd properties about said code centers,

sequency is the is the average rate of phase changes over each N chip code length,

said Walsh codes by definition are the {+1,-1} valued orthogonal Hadamard codes re-ordered with increasing sequency,

there are N discrete Fourier transform codes each with N real chips,

re-order said discrete Fourier transform even codes and odd codes according to increasing frequency,

construct a one-to-one correspondence of said N Walsh codes with

said N Fourier transform codes such that sequency corresponds to frequency, even codes correspond to even codes, and odd codes correspond to odd codes,

there are N Discrete Fourier Transform (DFT) codes each with N complex chips,

said DFT codes are arranged in increasing frequency and each code is the complex addition of a real axis code and an imaginary axis code,

construct a mapping which uses said N Fourier codes to construct said DFT codes,

use said mapping and said correspondence to generate real and imaginary axis component codes of said hybrid Walsh codes,

said hybrid Walsh codes $\tilde{W}(c)$ with code index $c=0,1,2,\ldots,N-1$, are re-orderings of said Walsh codes defined by equations

$$
\begin{array}{lll}
\text{for } c = 0, & \tilde{W}(c) & = W(0) + jW(0) \\
\text{for } c = 1,2,\ldots,N/2-1, & \tilde{W}(c) & = W(2c) + jW(2c-1) \\
\text{for } c = N/2, & \tilde{W}(c) & = W(N-1) + jW(N-1)) \\
\text{for } c = N/2+1,\ldots,N-1, & \tilde{W}(c) & = W(2N-2c-1) + jW(2N-2c)
\end{array}
$$

wherein $W(u)$ is said Walsh code for index u and $j=\sqrt{-1}$,

digital signal processors in the transmitter encoder and receiver decoder for CDMA communications have a memory assigned to said Walsh codes and memories assigned to said real axis and imaginary axis codes of said hybrid Walsh codes,

hybrid Walsh codes are generated by reading code chip values from said Walsh code memory and writing to said hybrid Walsh memories using addresses specified by said re-orderings of said Walsh codes,

said hybrid Walsh codes are read from said real and imaginary axis memories using said addressing for Walsh codes and,

said hybrid Walsh codes are implemented in the CDMA encoder for said transmitter and in the CDMA decoder for said receiver by replacing existing said Walsh real codes with said

hybrid Walsh complex codes using the same code vector indexing.

Claim **8.** (currently amended) Said codes in Claim 7 have properties comprising:
code chips take values {1+j, -1+j, -1-j, 1-j} in the complex plane,
code chips with a renormalization and rotation of the code matrix take values {1, j, -1, -j} in the complex plane,
inphase axis codes of the said codes are reordered Walsh or Hadamard codes,
quadrature axis codes of the said codes are reordered Walsh or Hadamard codes and,
codes have fast encoding and fast decoding algorithms.

Claim **9.** (currently amended) A method for generation and implementation of generalized hybrid Walsh codes for CDMA from code sets which include said hybrid Walsh, said Hadamard, said Walsh, said DFT, and pseudo-noise (PN), said method comprising:
tensor products also called Kronecker products are used to construct said codes,
an example 24 chip tensor product code is constructed from a 8 chip hybrid Walsh code and a 3 chip DFT code,
said 24 chip code is defined by a 24 row by 24 column code matrix C_{24} wherein row vectors are code vectors and column elements are code chips,
said 8 chip hybrid Walsh code is defined by a 8 row by 8 column code matrix $\widetilde{W}_8$,
said 3 chip DFT code is defined by a 3 row by 3 column code matrix E_3,
said C_{24} is constructed by tensor product of said $\widetilde{W}_8$ with said E_3

defined by equation

$$C_{24} = \widetilde{W}_8 \otimes E_3$$

wherein symbol "$\otimes$" is a tensor product operation,

row u+1 and column n+1 matrix element $C_{24}(u+1,n+1)$ of said C_{24} is defined by equation

$$C_{24}(u+1,n+1) = \widetilde{W}_8(u_0+1,n_0+1)\ E_3(u_1+1,n_1+1)$$

wherein

$$u+1 = u_0+1 + 3(u_1+1)$$

$$u = 0,1,\ldots,23$$

$$n+1 = n_0+1 + 3(n_1+1)$$

$$n = 0,1,\ldots,23$$

wherein u,n are code and chip indices for said codes C_{24} and u_0,n_0 are code and chip indices for said code $\widetilde{W}_8$ and u_1,n_1 are code and chip indices for said code E_3,

digital signal processors in said transmitter encoder and receiver decoder for CDMA communications have memories assigned to said C_{24}, $\widetilde{W}_8$, E_3 codes,

said C_{24} codes are generated by reading code chip values from said $\widetilde{W}_8$ memory and said E_3 memory,

said chip values are combined using said equations to yield said chip values for said C_{24} codes and write to said C_{24} memory,

said C_{24} codes are read from said memory and implemented in said encoder for said transmitter and in said decoder for said receiver,

an alternate method uses direct products to construct said codes.

an example 11 chip direct product code is constructed from said 8 chip hybrid Walsh code and said 3 chip DFT code,

said 11 chip code is defined by the 11 row by 11 column code matrix C_{11},

said C_{11} is constructed by direct product of said $\widetilde{W}_8$ with said E_3 defined by equation

$$C_{11} = \tilde{W}_8 \oplus E_3$$

wherein symbol "$\oplus$" is a direct product operation,

row u+1 and column n+1 matrix element $C_{11}(u+1,m+1)$ of said C_{11} is defined by equation

$$\begin{aligned} C_{11}(u+1,n+1) &= \tilde{W}_8(u_0+1,n_0+1) && \text{for } u=u_0,\ n=n_0, \\ &= E_3(u_1+1,n_1+1) && \text{for } u=8+u_1,\ n=8+n_1, \\ &= 0 && \text{otherwise,} \end{aligned}$$

said digital signal processors in said transmitter encoder and said receiver decoder for CDMA communications have memories assigned to said C_{11}, $\tilde{W}_8$, E_3 codes,

said C_{11} codes are generated by reading code chip values from said $\tilde{W}_8$ memory and said E_3 memory,

said chip values are used by said equations to yield said chip values for said C_{11} codes and write to said C_{11} memory,

said C_{11} codes are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver,

an alternate method uses functional combining to construct said codes,

an example 11 chip functional combined $\hat{C}_{11}$ code is constructed from said C_{11} codes by using codes to fill the two null subspaces of said C_{11}.

said $\hat{C}_{11}$ codes are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver and,

an alternate method uses a combinations of tensor products, direct products, and functional combining to construct said codes which are read from memory and implemented in said encoder for said transmitter and in said decoder for said receiver.

Claim **10**. (cancelled)